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Nitokra Copepods (Harpacticoida: Ameiridae) from Korea

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ABSTRACT

A taxonomic study on the genus *Nitokra* (Ameiridae) is accomplished. A total of five species are collected from coastal marshes, lagoons, and estuaries in South Korea. Among them, the latter three species are newly recorded from Korea: *N. spinipes* Boeck, *N. affinis californica* Lang and *N. pietschmanni* (Chappuis). Taxonomic accounts and a key to the species from Korea are given.

Key words: *Nitokra*, Ameiridae, Harpacticoida, Copepoda, Korea

INTRODUCTION

Genus *Nitokra* Boeck, 1864 is one of the representative neritic harpacticoids, currently recognized more than 24 species (Boxshall and Halsey, 2004). Most members of the genus are marine, but some species extend their inhabiting range to brackish waters or even to freshwaters.

In Korea, the taxonomic study on the genus *Nitokra* is rather scanty. Only the species name of *Nitokra lacustris* (Schmankevitch) is listed in KSSZ (1997), and recently a new species of *N. koreanus* Chang, 2007 is described by the senior author (CYC). As a comprehensive study on the brackish-water copepod fauna, the author has extensively examined the copepods deposited in the specimen room of the Department of Biological Science, Daegu University, which have been collected from the various coastal waters such as salt marshes, estuaries, and lagoons in South Korea since 1986.

As a result, five species belonging to the genus *Nitokra* are classified, including three species new to Korean fauna. Taxonomic accounts on them are dealt herein, with a key to the species of the genus *Nitokra* from Korea.

MATERIALS AND METHODS

Copepod specimens examined in the present study were collected from estuaries, salt marshes and brackish-water lakes at 26 localities (Fig. 1) in South Korea during the period from June, 1986 to May, 2007. Samplings were made with a dipnet (diameter 18 cm) or a conical plankton net of 63 μm mesh aperture. Copepod samples were fixed and stored in 4% buffered formalin.

Specimens were dissected and mounted in lactophenol on H-S slide, after the treatment in a solution of 5% glycerin-95% ethyl alcohol for 1-2 days. Dissection is performed using two needles made from 0.25 mm diameter tungsten wire by electrolysis (Huys and Boxshall, 1991). Dissected specimens were observed under a differential interference contrast microscope (Olympus BX51) with Nomarski optics. Figures were prepared with the aid of a camera lucida. Measurements were done with a digital camera for microscope (Cool SNAP 5.0M, Roper Scientific Co., U.S.A.) and a calibration software QCapture Pro (ver. 5.0, Media Cybernetics Inc., U.S.A.).

Abbreviations used in the text and figures follow the conventional ones frequently used in the copepod taxonomy: A1, antennule; A2, antenna; Fu, furcal rami (=caudal rami); P1-P5, legs (pereiopods) 1-5; enp 1-3 or exp 1-3, the first to third endopodal or exopodal segments of each leg.

TAXONOMIC ACCOUNTS

[1]*Family Ameiridae Monard, 1927

[2]*Genus *Nitokra* Boeck, 1864

[3]***Nitokra spinipes* Boeck, 1864 (Figs. 2, 3)**

Nitokra spinipes Boeck, 1864, p. 274 (cited from Lang, 1948); Lang, 1948, p. 810, fig. 325; Borutzky, 1952, p. 110, fig. 47: 1-14; Wells and Rao, 1987, p. 127.

Nitocra spinipes armata Lang, 1965, p. 352, figs. 192-195.

Material examined. 1♀, 1♂, Wangpicheon Str. (estuary),

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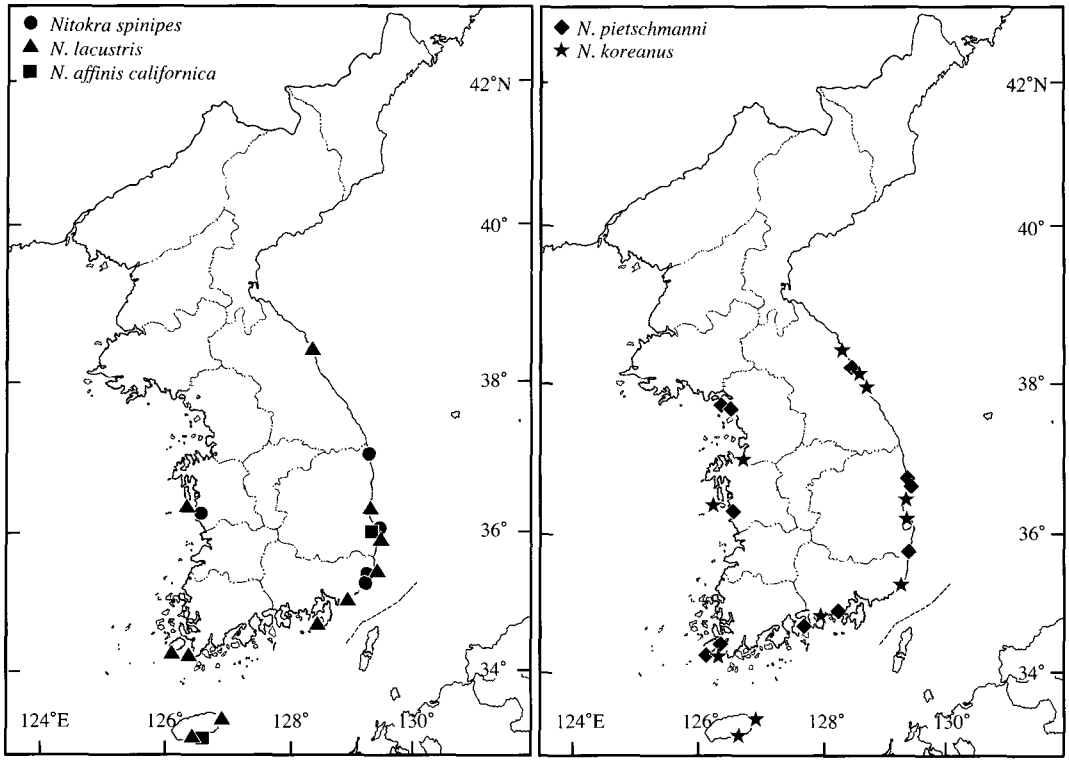

Fig. 1. Sampling localities of five *Nitokra* species in South Korea.

Uljin, 3 Apr. 2004 (C.Y. Chang and J.M. Lee); 14♀♀, 7♂♂, Gokgangcheon Str. (estuary), Chilpo, Pohang, 3 Feb. 2007 (C.Y. Chang, J.M. Lee and S.W. Lee); 1♀, 1♂, Hyeongsangang R. (estuary), Pohang, 24 Sep. 2005 (H.W. Lim); 36♀♀, 5♂♂, Balsan-ri (coastal well), Pohang, 29 Apr. 2007 (C.Y. Chang, J.M. Lee and H.J. Yoon); 6♀♀, 2♂♂, Taehwagang R., Ulsan (Myeongchongyo Br.), 29 Jan. 2005 (J.M. Jeon); 4♀♀, Hoiyacheon Str. (estuary, Seosaenggyo Br.), Ulsan, 24 Sep. 2006 (S.B. Lim and S.Y. Cho); 6♀♀, 2♂♂, same locality, 31 Mar. 2007 (C.Y. Chang).

Diagnosis. Female: Body (Fig. 2A) cylindrical, 530-620 µm long. Prosomites bearing 10-12 sensillae along posterior margin. Genital double-somite subdivided dorsally, bearing subcuticular ridge marking line of fusion dorsally. Urosomites except anal somite each bearing spinule row along posterior margin, with hyaline fringe posteriorly, except for mid-dorsal parts of genital double-somite and next urosomite (Fig. 2B, C). Anal operculum convex with 8-12 sharp spines along posterior edge (Fig. 2B, arrow). Fu nearly as long as broad in ventral view, with a few spinules on inner distal corner. Dorsal caudal seta (caudal seta VII) locating just ahead of inner caudal seta. A1 8-segmented. A2 exp 1-segmented, with 3 apical setae. P1 enp shorter than exp; enp 1 elongated, a little shorter than sum of exp 1 and exp 2, with 1 stout inner seta on distal third of inner margin of enp 1 (Fig. 2D). P2-P4 (Fig. 3A-C), enp 1 with inner seta; enp 3 with modified inner seta; P2 enp 3 with 1 spine and 3 setae; P4 exp 3 with elongate, stout, spiniform inner distal seta for supporting egg sac. P5, baseoendopod a little protruding, not reaching to middle of exopod, bearing total 5 setae (Fig. 2E); exopod ellipsoidal, tapering distally, 2.0-2.2 times longer than wide, with total 5 setae, with spinule row along distal half of inner margin.

Male: Body 470-510 µm long, a little slenderer than female. Spinule ornamentation of urosomites and anal operculum nearly same as in female. Fu a little shorter than wide. Inner distal seta on P1 coxa modified like 1 hook-like protrusion; other seta/spine armature of P1-P4 not designating sexual dimorphism. P5 (Fig. 2F), inner lobe of baseoendopod not protruding, posterior margin rather straight; with 5 setae (sometimes 3 setae); exp oval, 1.2 times longer than broad, bearing 6 setae including 1 minute seta at outer distal corner of exopod.

Ecology. Basically marine, but known as euryhaline; in Korea, frequently occurred from the estuaries and salt marshes around coasts of South Korea.

Distribution. Cosmopolitan.

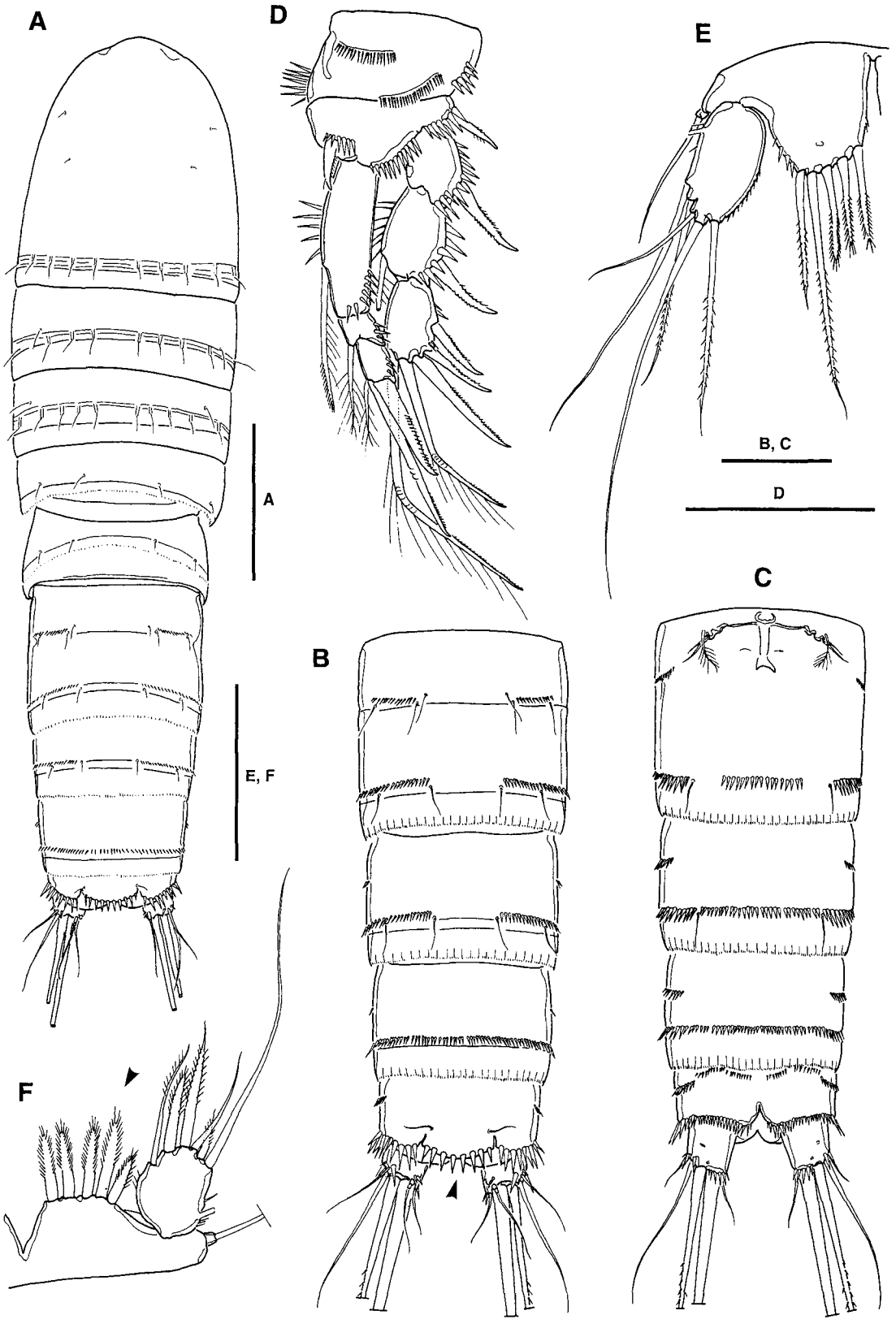

Fig. 2. *Nitokra spinipes*. A-E, female: A, habitus, dorsal; B, urosome, dorsal; C, urosome, ventral; D, P1; E, P5. F, male P5. Scale bars=100 μm (A), 50 μm(B-F).

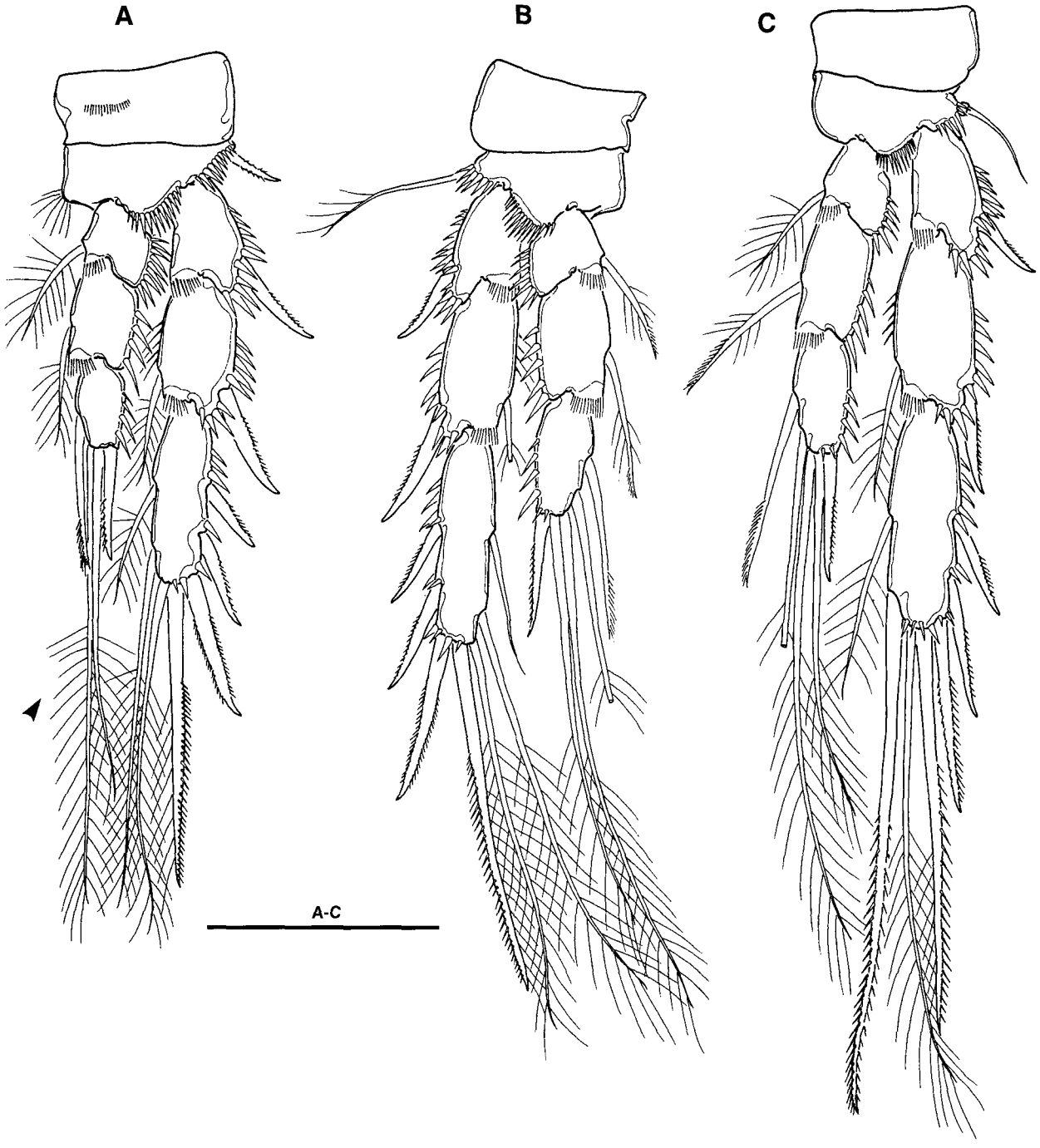

Fig. 3. *Nitokra spinipes*, female. A-C, P2-P4. Scale bar=50 μm (A-C).

Remarks. Besides *N. spinipes s. str.*, two subspecies have been known: *N. spinipes orientalis* Sewell, 1924 from Red Sea and Indian Ocean and *N. spinipes armata* Lang, 1965 from Californian Pacific coast, U.S.A. The three 'subspecies' are divided by the spinule arrangement of urosomites. Korean specimens are closer to *N. spinipes armata* in general appearance of the spinule arrangement. However, in the same time, some part of the spinule arrangement resembles that of *N. spinipes s. str.* Moreover, the number of spines on anal operculum is intermediate between those of two groups, and the number of seta on male P5 baseoendopod is variable (5 in general, but 3 in the specimens from the Yel-

low Sea). Following Wells and Rao's opinion (1987), I admit the possibility of its worldwide geographical distribution and the wide variability of the species, not to recognize subspecies taxa of this species.

[1]***Nitokra lacustris* (Schmankevitch, 1875) (Figs. 4, 5)**

Transfuga lacustris Schmankevitch, 1875, p. 155 (cited from Dussart, 1967).

Nitocra muelleri van Douwe, 1905, p. 434.

Nitocra lacustris: Pesta, 1932, p. 76; Gurney, 1932, p. 65; Lang, 1948, p. 81; Borutzky, 1952, p. 108, fig. 47: 19-22; Dussart, 1967, p. 204, fig. 75; Janetzky et al., 1996, p. 47, fig. 13.

Material examined. 1♀, Hwajinpo, 21 Jun. 1986 (S.M. Yoon); 2♀♀ (ovi.), 5♀♀ (3 ovi.), 3♂♂, Gokgangcheon Str., Chilpo, Pohang, 24 Oct. 2005 (C.Y. Chang, J.M. Lee and S.W. Lee); Balsan-ri (coastal well), Pohang, 29 Apr. 2007 (C.Y. Chang, J.M. Lee and H.J. Yoon); 7♀♀, 1♂, Taehwa R. (Taehwa Bridge), Ulsan, 29 Jan. 2005 (C.Y. Chang); 4♀♀, estuary of Hoiyacheon Str. (Seosaenggyo Bridge), Ulsan, 24 Sep. 2006 (S.B. Lim and S.Y. Cho); 1♀, estuary of Ilgwangcheon Str., Busan, 21 Jun. 2006 (C.Y. Chang and J.M. Lee); 1♀, Jeseungdang (ditch), Hansando Is., Tongyeong, 20 Aug. 1987 (C.Y. Chang); 2♀♀, estuary of Uisincheon Str., Jindo Is., 18 Oct. 2004 (J.M. Jeon and H.W. Lim); 5♀♀, Gulpocheon Str. (estuary), Jindo Is., 18 Oct. 2004 (J.M. Jeon and H.W. Lim); 1♀, Jodo Is. (coastal spring), Jindo, 19 Oct. 2004 (H.W. Lim and J.M. Jeon); 2♀♀, Myeongjang Beach (bog), Janggodo Is., Boryeong, 7 Aug. 2003 (J.M. Lee and J.M. Jeon); 2♀, Seongsanpo (reed marsh), 12 Feb. 1987 (C.Y. Chang); 2♀♀, Saeseom Is. (salt marsh), Seogwipo, Jeju, 27 Apr. 2006 (C.Y. Chang and J.M. Lee).

Diagnosis. Female: Body cylindrical, relatively small, 610-650 μm long, usually tinged with pale brown. Urosomites lacking spinule row at mid-dorsal part of posterior margin. Anal operculum (Fig. 4B) armed with 7-8 sharp spines on its posterior margin. Fu nearly rectangular, a little shorter in dorsal view, but slightly longer than wide in ventral view (Fig. 4C); with spinules at distomedial corner, lacking setule rows on middle of medial face. P1 (Fig. 4D), endopod a little shorter than exopod; enp 1 much shorter than sum of exp 1 and exp 2. P2-P4, enp 1 lacking inner seta (Fig. 5A-C, arrow); P2 enp 3 with 1 spine and 3 setae; P4 exp 3 with elongate, stout, spiniform inner distal seta. P5 (Fig. 4E), baseoendopod with flat posterior margin, reaching to middle of exopod, bearing total 5 setae; exopod ellipsoidal, tapering distally, 2.2-3.0 times longer than wide (Fig. 4E, arrow), with total 6 setae, with setule row on middle of inner margin.

Male: Body about 530 μm long. P5 (Fig. 4F), inner lobe of baseoendopod not protruding, with 1 stout inner seta and 1 short, naked outer seta; exopod oval, about 1.5 times longer than broad, bearing 6 setae.

Ecology. This species is known as eurythermic and euryhaline (Lang, 1948), and inhabits brackish-waters or even freshwaters in the tidal reaches, especially from reed marshes with high organic contents in Korea, although not abundant. This species often co-occurs with other *Nitokra* species, especially with *N. koreanus* and *N. pitschmanni* in Korean coasts (*see* Fig. 1).

Distribution. Korea, China (the Yellow Sea), Japan, Russia, Germany, U.K., France, Rumania, Hungary, Italy, Spain, Greece, Egypt, Algeria, Morocco, Bermuda Is., Mexico.

Remarks. This species is evidently distinguished from other congeneric species by the character combination as follows: (1) P2 enp 3 armed with only 2 setae and 1 spine; (2) P1 enp 1 not elongated, shorter than sum of exp 1 and exp 2; (3) enp 1 of P2-P4 lacking inner seta. Korean specimens coincide well with this wide distributed *N. lacustris s. str.*

Nitokra lacustris is allied with *N. arctolongus* Shen and Tai, 1973 from Kwangtung, South China in the first two characteristics, that is, only 2 inner setae on P2 enp 3 and relatively short P1 enp 1. Besides lacking inner seta on P2-P4 enp 1, *N. lacustris* is different from *N. arctolongus* by having not-elongate P5 exopod in female (a little less than 2 times as long as wide in *N. lacustris*, against more than 3 times in *N. arctolongus*) and 2 setae on P5 baseoendopod in male (against 3 setae in *N. arctolongus*).

'*Nitokra lacustris*' *sensu* Tai and Song, 1979 from the Chinese coasts of the Yellow Sea is not *N. lacustris s. str.* in bearing 1 inner seta each on P2-P4 endopods. (cf. Tai and Song, 1979, p. 197, figs. 104e-g). The authors once collected several female from the western and southwestern coasts of Korea, which have the same setal armature as those of '*N. lacustris*' *sensu* Tai and Song. As '*N. lacustris*' *sensu* Tai and Song was inadequately described, omitting the important characters such as the spinulation of urosomites and the ornamentation of Fu, it is not clear at present that they might be identical to each other, and should be treated as a distinct species. Korean specimens show some other discrepancies from *N. lacustris* by bearing 4-5 stout spines on the posterior margin of anal operculum (against 8-9 spines in *N. lacustris*), the setule row on medial face of Fu, and a little elongate setae on the anal somite lappet. The latter two characteristics are reminiscent of *N. lacustris colombianus* Reid, 1988 from the Caribbean coast of Colombia.

[1]*예쁜이장수노벌레

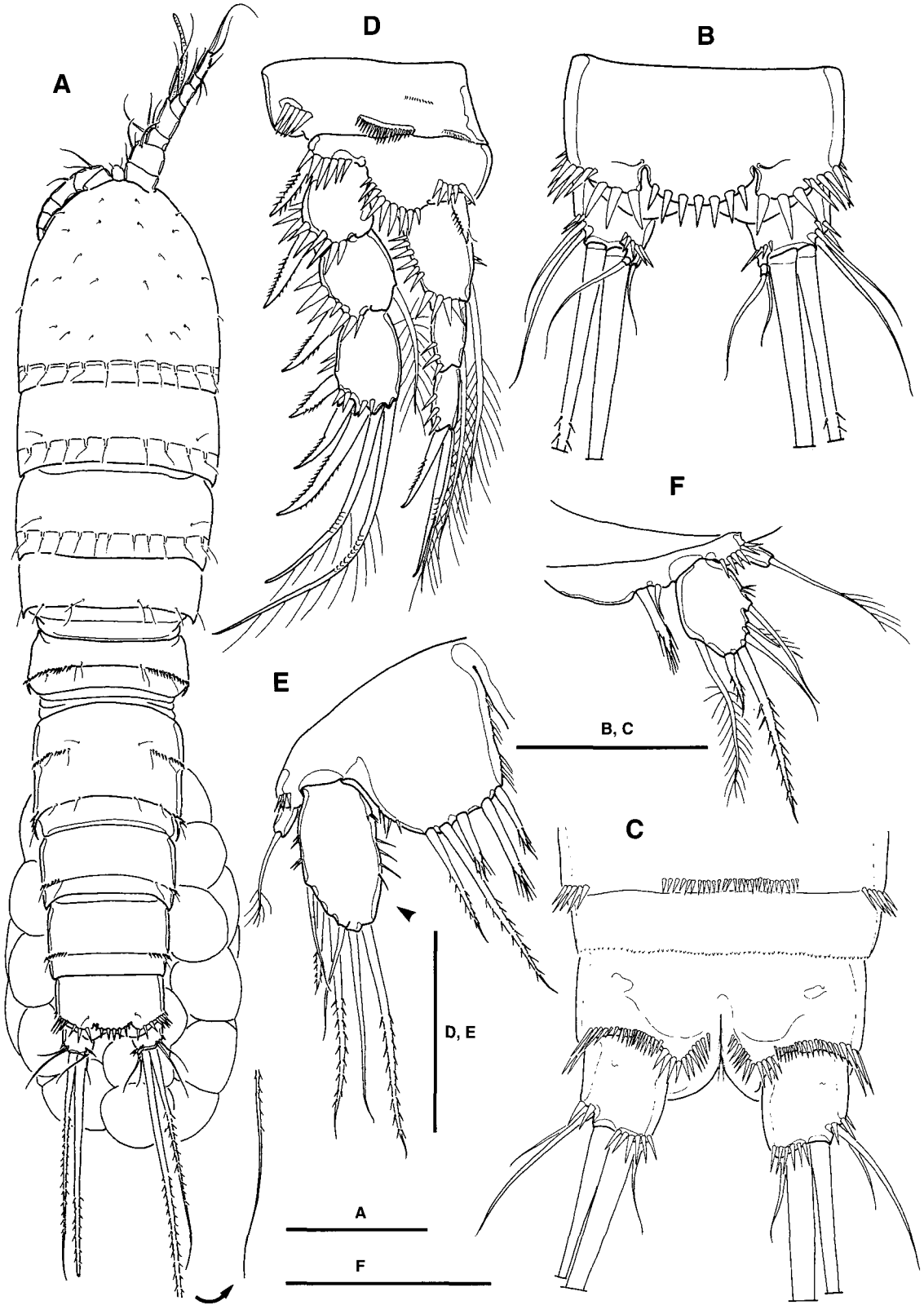

Fig. 4. *Nitokra lacustris*, female. A, habitus, dorsal; B, anal somite and Fu, dorsal; C, anal somite and Fu, ventral; D, P1; E, P5. F, male P5. Scale bars=100 μm (A), 50 μm (B-F).

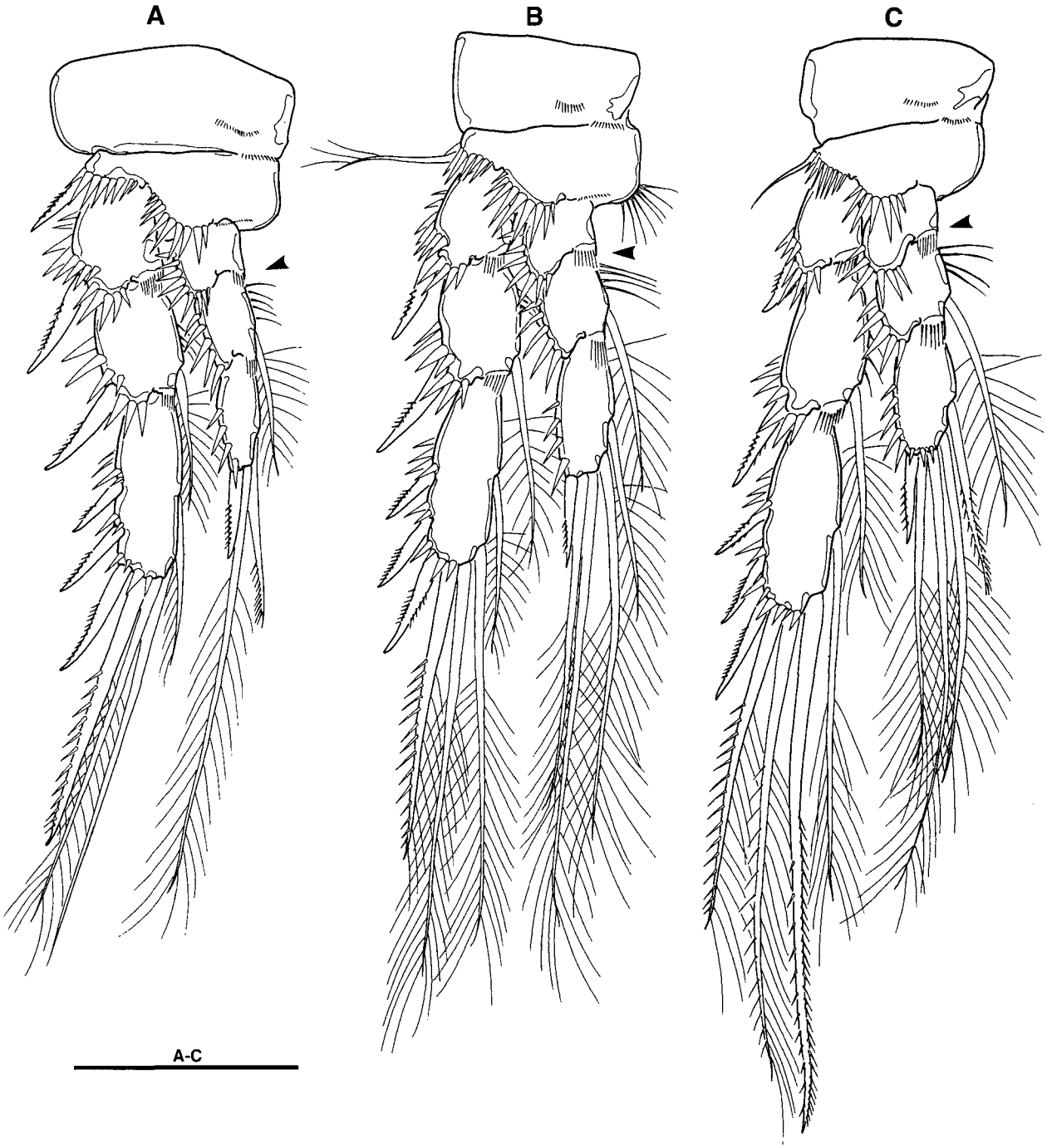

Fig. 5. *Nitokra lacustris*, female. A-C, P2-P4. Scale bar=50 μm (A-C).

[1]***Nitokra affinis californica* Lang, 1965 (Fig. 6)**

Nitocra affinis Gurney f. *californica* Lang, 1965, p. 357, figs. 196-198; Kunz, 1975, p. 188, figs. 74-75; Apostolov and Marinov, 1988, p. 234, figs. 92-93.

Nitocra affinis californica: Bodin, 1997, p. 120.

Material examined. 1♀, 1♂, estuary of Hyeongsan R., Pohang, 24 Sep. 2005 (H.W. Lim); 1♀, 1♂, same locality, 24 Oct. 2005 (C.Y. Chang); 1♀, 1♂, Saeseom Is. (salt marsh), Seogwipo, Jeju Is., 27 Apr. 2006 (C.Y. Chang and J.M. Lee).

[1]*유사수려장수노벌레 (신칭)

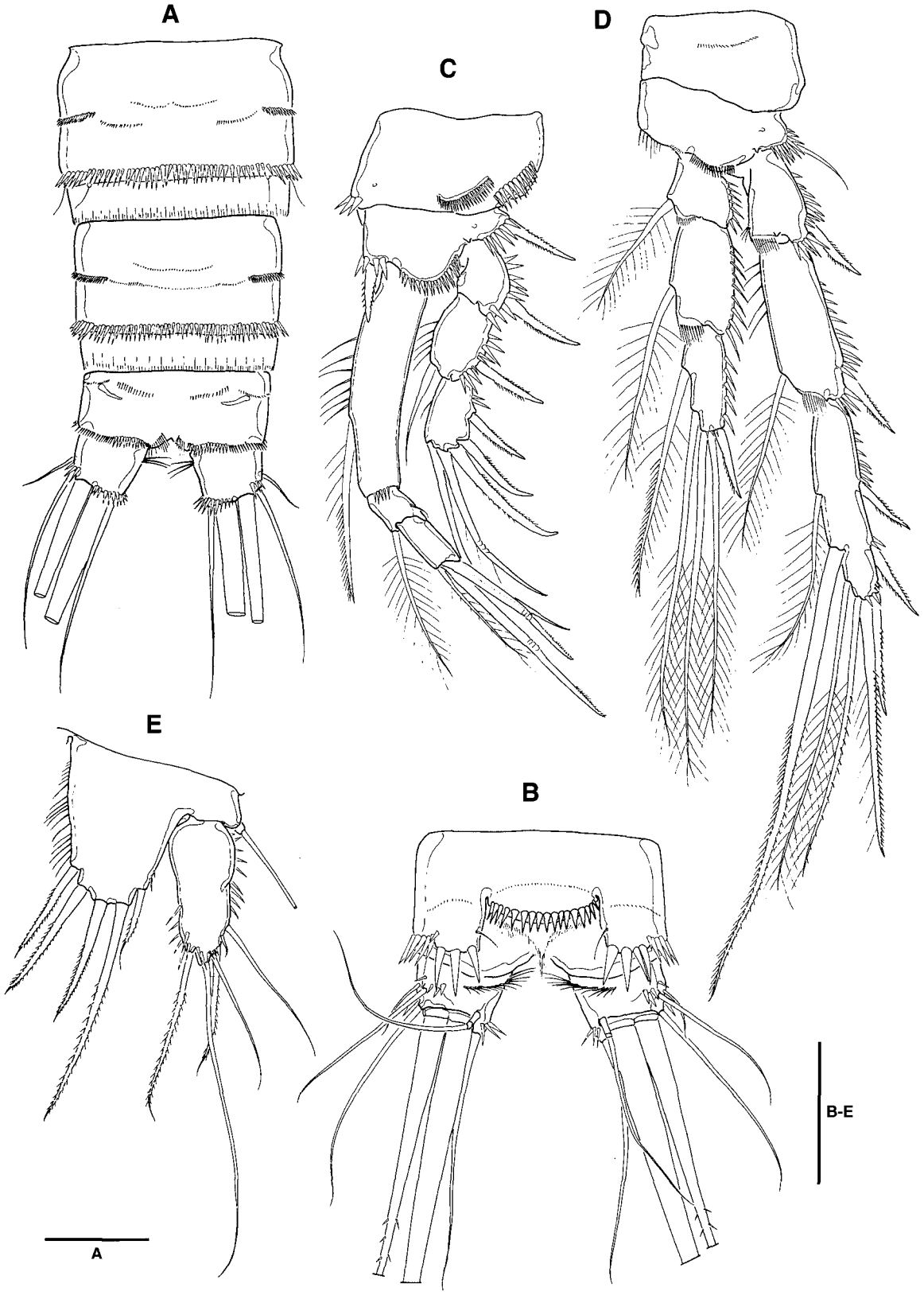

Fig. 6. *Nitokra affinis californica*, female. A, urosomites, ventral; B, anal somite and Fu, dorsal; C, P1; D, P4; E, P5. Scale bars=50 μm (A-E).

Diagnosis. Female: Body cylindrical, relatively big, 710-820 μm long. Antepenultimate urosomite bearing spinule row along whole posterior margin, with hyaline fringe posteriorly (Fig. 6A). Anal operculum convex with 16-20 sharp spines along posterior edge (Fig. 6B). Fu short, about 2/3 times as long as broad, with oblique setule row along inner face of Fu. P1 enp 1 as long as or slightly shorter than exopod (Fig. 6C). P2 enp 3 with 1 spine and 3 setae. P4 exp 3 (Fig. 6D) with 8 spines and setae in total, middle inner seta elongate, stout, spiniform. P5 (Fig. 6E), exopod pyriform, tapering distally, 2.0-2.2 times longer than wide, with total 6 setae.

Male: Body about 620 μm long. P5 exopod pyriform, 1.6 times longer than broad, bearing 6 setae; baseoendopod with 4 setae.

Ecology. Collected from coastal marshes and estuaries.

Distribution. Korea, U.S.A. (California), Bulgaria, South Africa.

Remarks. As mentioned in the original description by Lang (1965), *N. affinis californica* is differentiated from the nominate species by the relatively shorter P1 enp 1 (only as long as or slightly shorter than exopod, while longer than exopod in *N. a. affinis*) and posterior edge of antepenultimate urosomites encircled with spinules (while spinulose dorsally to ventrolaterally in *N. a. affinis*). Furthermore, P5 exopod of both sexes are typically pyriform, while rather ellipsoidal in *N. a. affinis*. Two other subspeicies are recorded: *N. a. rijekana* Petkovsky, 1954 and *N. a. stygia* Por, 1968. *Nitokra affinis californica* differs from the former by the relatively shorter P1 enp 1 (against much longer than exopod in *N. a. rijekana*), baseoendopod of male P5 bearing 4 setae (against 5 setae in *N. a. rijekana*), and middle inner seta on P4 enp 3 much longer and stronger than inner distal seta, moreover, distinguished from the latter by elongate, pyriform female P5 exopod (more than 2 times as long as wide in *N. a. affinis*, against oval and nearly as long as wide in *N. a. stygia*).

[1]***Nitokra pietschmanni (Chappuis, 1934) (Figs. 7, 8)**

Nitocra platypus pietschmanni Chappuis, 1934, p. 634, pls. 5-6 (cited from Lang, 1948); Lang, 1948, p. 817, fig. 372: 3b.

Nitocra pietschmanni: Tai and Song, 1979, p. 200, fig. 106; Dussart and Defaye, 1990, p. 53; Ishida and Kikuchi, 2000, p. 13, fig. 5.

Material examined. 1♀, 1♂, Chojijin, Ganghwado Is., 29 Sep. 2004 (G.S. Min); 1♀, 1♂, Hwado-ri (ditch), Ganghwado Is., 20 May 2004 (J.A. Baek); 1♀, estuary of Dongmyeongcheon Str., Yangyang, 1 Mar. 2005 (C.Y. Chang, J.M. Lee, J.M. Jeon and H.W. Lim); 1♀, 1♂, Songcheoncheon Str., Goraebul, Yeongdeok, 3 Apr. 2004 (C.Y. Chang and J.M. Lee); 2♀ ♀, 1♂, estuary of Songcheoncheon Str., Daejin, Yeongdeok, 3 Apr. 2004 (C.Y. Chang, J.M. Lee, J.M. Jeon and H.W. Lim); 4♀ ♀, 1♂, Haseocheon Str., Yangnam, Gyeongju, 26 Mar. 2005 (J.M. Jeon and H.W. Lim); 1♀, estuary of Gasancheon Str., Chukdong, Sacheon, 26 Apr. 2007 (C.Y. Chang, J.M. Lee and H.J. Yoon); 2♀ ♀, Deokchung-dong (coastal well), Yeosu, 4 Jul. 1988 (J.S. Shin); 1♀, 2♂♂, Naesan-ri (streamlet), Jindo Is., 17 Oct. 2004 (J.M. Jeon and H.W. Lim); 5♀ ♀, 3♂♂, Gulpo-ri (streamlet), Jindo Is., 18 Oct. 2004 (J.M. Jeon and H.W. Lim); 2♀ ♀, Nampo tidal embankment, Boryeong, 3 May 2007 (H.J. Yoon and C.Y. Chang).

Diagnosis. Female: Body (Fig. 7A) 650-710 μm long. Urosomites bearing spinule row along posterior margin except mid-dorsal part, with hyaline fringe. Anal operculum convex with 4-6 sharp spines along posterior edge. Fu nearly as long as broad in ventral view, with a few spinules on inner distal corner, lacking setule rows on middle of medial face (Fig. 7B). P1 endopod a little shorter than exopod; enp 1 shorter than sum of exp 1 and exp 2, a little exceeding middle of exp 2 (Fig. 7C, arrow). P2-P4 (Fig. 8A-C), enp 1 with inner seta; P2 enp 3 with 1 spine and 3 setae; P4 exp 3 with 2 inner setae, inner distal seta elongate, spiniform for supporting egg sac. P5, baseoendopod a little protruding, beyond middle of exopod, bearing total 5 setae; exopod round (Fig. 7D, arrow), 1.2-1.3 times longer than wide, with total 6 setae, with spinules and setules only along inner margin.

Male: Body 580-610 μm long, a little slenderer than female. P5 (Fig. 7E), inner lobe of baseoendopod with 3 setae; exopod oval, a little longer than broad, bearing 6 setae with 1 tube-like structure outer proximally.

Ecology. Inhabiting estuaries and coastal marshes, containing high plant material.

Distribution. Korea, China, Japan, Hawaii Is.

Remarks. This species is originally recorded as a subspecies of *N. platypus* from Hawaii Is. However, it is apparently distinguished from the latter species in bearing inner seta on P3-P4 enp 1, and regarded as a distinct species. Korean specimens coincide exactly with both Chinese (Tai and Song, 1979) and Japanese (Ishida and Kikuchi, 2000) specimens. As this species is characteristic in having the round P5 exopod in both sexes, so it can be easily identified without dissection. *Nitokra pietschmanni* is one of the widely distributed species in Korean brackish waters as well as *N. koreanus* (*see* Fig. 1).

[1]*둥근수려장수노벌레 (신칭)

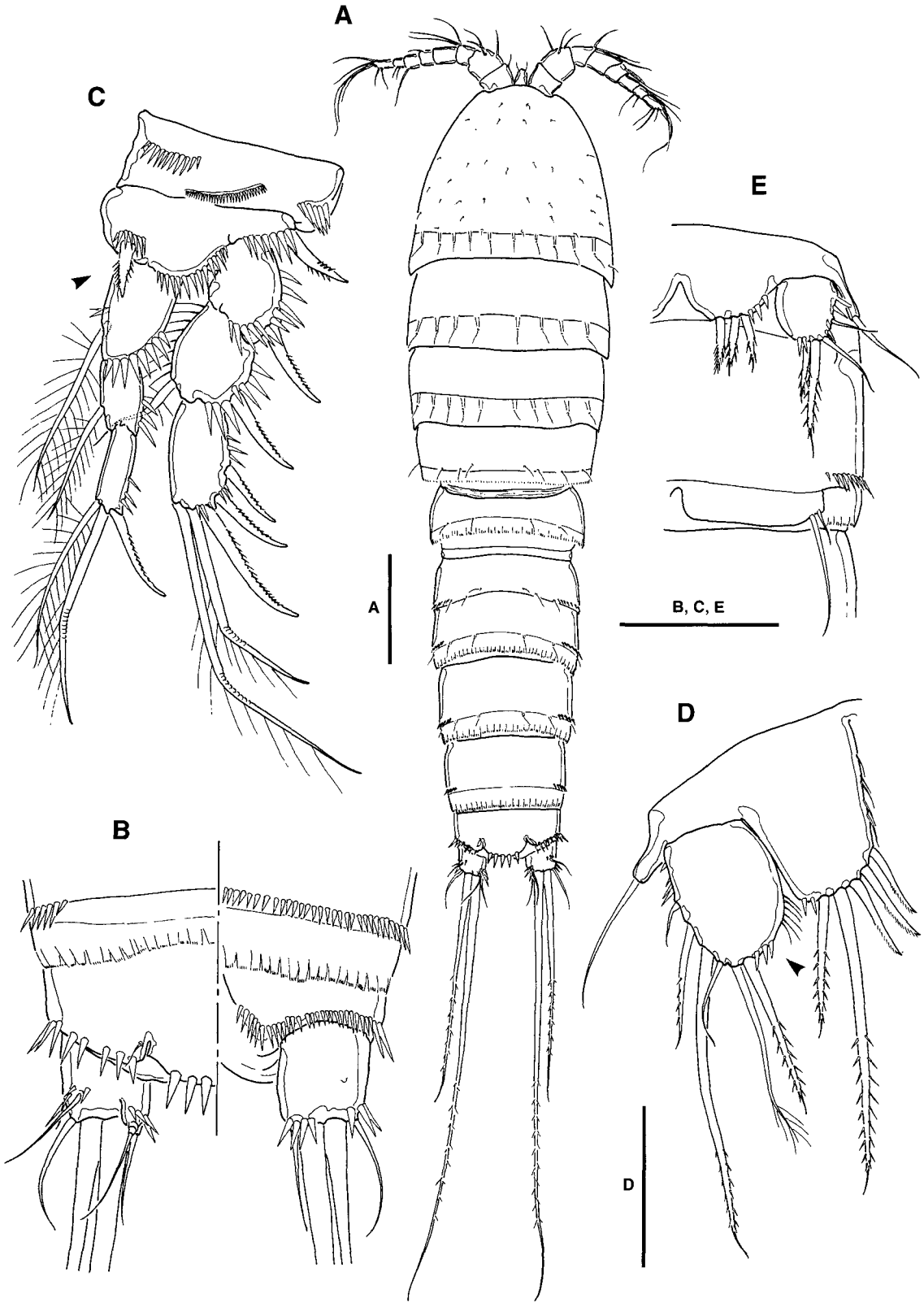

Fig. 7. *Nitokra pietschmanni*. A-D, female: A, habitus, dorsal; B, anal somite and Fu, dorsal (left) and ventral (right); C, P1; D, P5. E, male P5 and P6. Scale bars=100 μm (A), 50 μm (B-E).

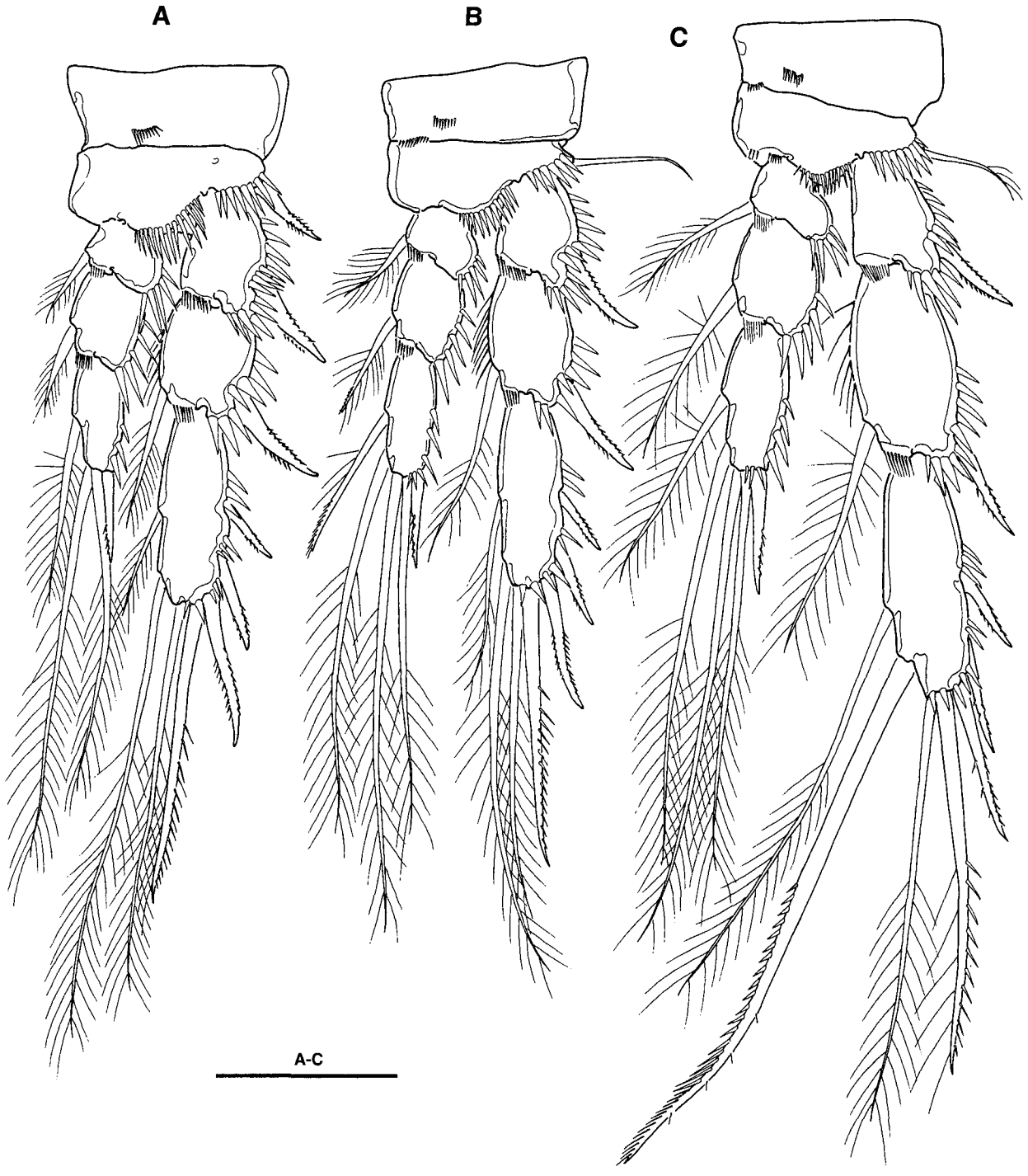

Fig. 8. *Nitokra pietschmanni*, female. A-C, P2-P4. Scale bar=50 μm(A-C).

[1]***Nitokra koreanus* Chang, 2007**

Nitokra koreanus Chang, 2007, p. 247, figs. 2, 3.

Previous records. Hwajinpo (brackish-water lake), Goseong; Hyangho Lake, Jumunjin; Obo-ri (estuary of a streamlet), Yeongdeok; Goggangcheon Str. (estuary), Chilpo,

[1]*수려장수노벌레 (신칭)

Pohang; Uishincheon Str. (estuary; coastal marsh), Jindo Is.; estuary of Maesancheon Str., Dangjin; Harye (estuary of a streamlet), Jungmun, Jeju Is.; Jongdal-ri (coastal swamp), Seongsanpo, Jeju Is. (Chang, 2007).

Material examined. 3♀♀, Taehwa R. (Taehwa Bridge), Ulsan, 29 Jan. 2005 (C.Y. Chang); 3♀♀, estuary of Gwangogcheon Str., Hadong, 26 Apr. 2007 (C.Y. Chang, J.M. Lee and H.J. Yoon).

Diagnosis. Female: Body 720-830 μm long. Anal operculum convex with 4-5 sharp spines along posterior edge. Fu a little broader than long, with transverse setule row along inner face. P1 enp 1 not elongated, much shorter than sum of exp 1 and exp 2; P2-P4 enp 1 with inner seta; P2 enp 3 with 1 spine and 3 setae. P4 exp 3 with elongate, spiniform inner distal seta. P5 baseoendopod a little protruding, bearing total 5 setae; exopod ellipsoidal, tapering distally, 2.2-2.5 times longer than wide, with total 6 setae.

Male: Body 630 μm in length. P5, inner lobe of baseoendopod not protruding, posterior margin rather straight; with 1 innermost swollen seta and 2 slender bare setae; exopod ellipsoidal, 2.5-3.0 times longer than broad, bearing 6 setae.

Ecology. Around the coast of South Korea, including Jeju Is., this species is common in the various types of brackish waters, such as estuaries, reed marshes and coastal lagoons.

Distribution. Korea.

Remarks. Nitokra koreanus most resembles *N. spinipes* and *N. pietschmanni* in having P1 enp 1 not longer than sum of exp 1 and exp 2, and exhibiting the same setal armature of P2-P4, viz., P3-P4 enp 1 with 1 inner seta, and bearing 3 setae on P2 enp 3. However, it is characteristic in having ellipsoidal P5 exopod in female, which is 2.5-3.0 times longer than wide (while pyriform, 1.3-2.0 times as long as wide in *N. spinipes*, and round, about 1.3 times as long as wide in *N. pietschmanni*). Moreover, *Nitokra koreanus* differs from *N. spinipes* by shorter P1 enp 1 (much shorter than sum of exp 1 and exp 2) and only 4-5 spines on the posterior margin of anal operculum (8-14 spines in *N. spinipes*). Furthermore, *N. koreanus* differs from *N. pietschmanni* by dorsal spinule row along posterior margin of each urosomites (against only lateral spinule rows in *N. pietschmanni*) (*see* Chang, 2007).

A key to the species of the genus *Nitokra* from Korea

1. P1 enp 1 nearly as long as whole exopod (Fig. 6C); P4 exp 3 with 8 setae and spines in total including 3 inner setae (Fig. 6D) ..... *N. affinis californica*
   P1 enp 1 much shorter than whole exopod; P4 exp 3 with 7 setae and spines in total including 2 inner setae 2
2. P2 enp 3 with 2 inner setae (Fig. 5A); P2-P4 enp 1 lacking inner seta (Fig. 5A-C, arrow) ..... *N. lacustris*
   P2 enp 3 with 3 inner setae (Fig. 3A, arrow); P2-P4 enp 1 with inner setae 3
3. P1 enp 1 nearly as long as sum of P1 exp 1 and exp 2 (Fig. 2D); posterior margin of anal operculum with 8-15 spinules (Fig. 2B) ..... *N. spinipes*
   P1 enp 1 much shorter than sum of P1 exp 1 and exp 2 (Fig. 7C); posterior margin of anal operculum with 4-6 spinules (Fig. 7B) 4
4. Female P5 exopod oval, a little longer than wide (Fig. 7D). ..... *N. pietschmanni*
   Female P5 exopod ellipsoidal, 2.5-3 times longer than wide ..... *N. koreanus*

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